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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/376,063	08/17/1999	SEIJI ANDOH	OKI-226	5971

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EXAMINER
DATSKOVSKIY, MICHAEL V

ART UNIT	PAPER NUMBER
2835	

DATE MAILED: 03/31/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/376,063	ANDOH, SEIJI	
	Examiner	Art Unit	
	Michael Datskovsky	2835	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 March 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *20,22,24-29 and 31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *20,22,24-29 and 31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 08/26/2002 have been fully considered but they are not persuasive. Examiner disagrees with applicant's statement that: "...a functional limitation, namely "the bumps of the first bump unit are sufficiently close to each other that upon application of the heat treatment to the device, the bumps of the first bump unit fuse into a unitary body", that fundamentally distinguishes the present invention over Katchmar." As it was already said in the previous Office Action communications: First – this limitation is indefinite because the term "sufficiently close" is not clear from the description of the application; Second – this limitation is inherently known in the art as " a collapse of solder balls", which mainly is avoided in the modern so called "collapse prove" technologies.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 26, 28 and claims 27, 29-31 as dependent on them are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. The terms: "distances are set such that upon application of a heat treatment to the device, the bumps of the first bump unit melt so as to become connected and fuse

to each other as a unitary body" in claim 26 and " bumps of the first bump unit are sufficiently closed to each other that upon the application of the heat treatment to the device, the bumps of the first bump unit fuse into a unitary body" in claim 28 are relative terms which renders the claims indefinite. The terms are not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 20, 22, 24-29 and 31 (claims 26 – 29 and 31 as best understood by examiner) are rejected under 35 U.S.C. 103(a) as being unpatentable over Katchmar in view of Bond et al.

Katchmar teaches a semiconductor device, figs 1-5, comprising: a substrate 12 having a main surface 14 and a back surface 16, wherein said back surface 16 has a central area 32, an intermediate area surrounding said central area 32 and a peripheral area surrounding said intermediate area; a semiconductor chip 18 formed on said main surface; a first bump unit formed of solder bumps 40. Fig. 5 disposed at a first distance apart from each other, and located in said central area of said back surface, wherein said first bump unit radiates heat from said semiconductor device; a second bump unit

formed of solder bumps 24 disposed at a second distance apart from each other and located in said peripheral area of said back surface, wherein said second bump unit transmits signals (col.6, lines 50-53), wherein the second bump unit is greater in quantity of solder balls that the first bump unit, and said solder balls are spherical in shape. Katchmar teaches furthermore a second distance between signals bumps being greater than a first distance between heat transferring bumps (col.7, lines 39-47). Also in the embodiment shown in figs.1-4 Katchmar teaches that said central area could be thermally connected to the circuit board by a solid melted solder mass 26.
Katchmar does not teach said intermediate area being a distinct area and that second distance is less than a width of the intermediate area, and said melted solder mass (unitary body) can be made by locating bumps of the first bump unit sufficiently closed to each other that upon the application of the heat treatment to the device, the bumps of the first bump unit fuse into a unitary body. Semiconductor devices (packages) comprising two groups of solder balls– one central for dissipation of the heat and another peripheral for distributing electrical signals with a distinct intermediate area between them are well known in the art. Good examples are previously submitted by the examiner references by Huang et al (US Patent 6,359,341); Barrow (US Patent 5,894,410); Kim (US Patent 6,268,568); Haley (US Patent 5,506,756); Shim et al (US Patent 5,864,470) and Koike (Japan Patent JP409321188A); along with newly discovered references by Lo et al (US Patent 6,282,094); Lin et al (US Patent 6,057,596) and Jakobs (US Patent 6,294,407). Bond et al teach a semiconductor device 8, figs 1-6, comprising: a substrate 14 having a main surface and a back surface,

wherein said back surface has a central area, a distinct intermediate area surrounding said central area and a peripheral area surrounding said intermediate area; a semiconductor chip 10 formed on said main surface; a first bump unit formed of solder bumps 18 disposed at a first distance apart from each other, and located in said central area of said back surface, wherein said first bump unit radiates heat from said semiconductor device; a second bump unit formed of solder bumps 18 disposed at a second distance apart from each other and located in said peripheral area of said back surface, wherein said second bump unit transmits signals, the second distance is greater than the first distance, the second distance is less than a width of the intermediate area (see fig.1 in the enclosed page from reference by Bond et al with red color indicating discussed sizes), and the second bump unit is greater in quantity of solder balls that the first bump unit, said solder balls are spherical in shape. Bond et al also show in fig.2 bumps 18 of the first (central) bump unit located so closed to each other (touching each other) that upon the application of the heat treatment to the device, they will inherently fuse into a unitary body. It would have been obvious to one skilled in the art at the time invention was made to employ a distinct intermediate area between the first and second groups of solder balls, the second distance being less than a width of the intermediate area, and to locate bumps of the first bump unit so closed to each other that upon the application of the heat treatment to the device, the bumps of the first bump unit will fuse into a unitary body as it is shown by Bond et al in the device by Katchmar in order to avoid shortening between thermal and signal solder balls while applying a heat to melt said thermal solder balls in a unitary bode, and to enhance heat

dissipation by a central group of solder balls. Regarding to the claim 31: Katchmar and Bond et al tea disclose the claimed invention except for that "the first distance is about 1 to 1.4 times the diameter of the bumps of the first bump unit, and the second distance is about 1.6 to 1.7 times the diameter of the bumps of the second bump unit. It would have been an obvious matter of design choice to make the first distance about 1 to 1.4 times the diameter of the bumps of the first bump unit, and the second distance about 1.6 to 1.7 times the diameter of the bumps of the second bump, since such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955). Applicant has not shown that these particular ranges of sizes are critical by showing that the claimed range achieves unexpected results relative to the prior art range. (In re Woodruff, 919 F. 2d 1575, 16 USPQ2d 1934, Fed. Cir. 1990). To establish unexpected results over a claimed range, applicant should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. (In re Hill, 128 USPQ 197 CCPA 1960).

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Datskovsky whose telephone number is (703) 306-4535. The examiner can normally be reached on Mn - Fry 8 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Darren E. Schuberg can be reached on (703) 308-4815. The fax phone numbers for the organization where this application or proceeding is assigned are (703)

872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Patent Examiner

Michael Datskovsky

March 25, 2003